Summary of DWR's submittal to USFWS for Delta Smelt Protection

Summary:

Rather than proposing significant protections for delta smelt, much of the focus of the documents is to argue that temperature and food web impacts and other stressors, rather than entrainment by the CVP/SWP, are responsible for the decline in delta smelt abundance. DWR's proposal attempts to reduce peak entrainment events, but it does not address any other impacts of the CVP/SWP operations on delta smelt (such as reduced fall open water habitat). The Fish Protection Trigger (FPT) proposed herein is described as a state analogue of the CVPIA b(2), and appears to have limited water assets, but no detail is provided on the scope of those assets. Also, they argue that the proposal provides benefits to salmonids as well, but there is no analysis or discussion of how the measures would help salmonids.

The three specific elements of the FPT are significantly weaker than the Wanger Rules. They allow greater reverse OMR flows in Action 1 and Action 3 (particularly in Action 3), allow greater averaging periods for measuring the actions (thus allowing higher instantaneous reverse flows), and relax the trigger for implementing Action 2. DWR's proposal also does not include Action 4 (VAMP), Action 5 (prohibition on HORB and ag barriers), or Actions 6-8 (increased delta smelt monitoring and sampling). The OCAP BA submitted by the agencies in August 2008 includes the HORB and South Delta Temporary Barriers Project, proposing to close the barrier on April 15 and maintaining it until at least May 15, and then a second period from early September to late November. *See* OCAP BA (August 2008) at 2-113 to 2-114, 13-58 to 13-60.

The table that follows compares the DWR proposal with the Wanger Rules. Because I only compared it with a short summary of the Wanger Rules, it might be worthwhile to review those rules in detail to see how much this proposal departs from the existing interim protections.

On the pages that follow, I have excerpted key passages that explain the proposal, the rationale, and provide context for it.

Finally, I have not yet read Bryan Manly's "Statistical Analysis of Variables Possibly Influence Delta Smelt Abundance," but I expect that it also explains why the pumps aren't the problem.

	Wanger Rules (summary)	DWR Proposal	Notes
Action 1	OMR greater than -2,000 cfs on 10 day period, on or after Dec. 25 based on turbidity and Sac River flows, ending after 10 days, depending on Sac River Flows, when spawning occurs, and water temps	OMR flows maintained -2,000 to -5,000 on 10 day average, on or after Dec. 20, based on turbidity and Sac River flows, ending upon the earlier of 10 days, Sac River flows greater than 80,000 cfs, or onset of spawning	• Allows greater reverse flows (up to 5,000 cfs) • Lasts for shorter period? • Is averaging period the same?
Action 2	OMR greater than -5,000 cfs on 7 day running average, following Action #1 or Jan 15 depending on Sac River flows, ending at onset of spawning or when Delta water temps reach 12 degrees Celsius	OMR flows maintained at -5,000 cfs on 14 day running average with 7-day average within 1,000 cfs of 14-day average, following (1) 3 days of increasing salvage and Sac River flows below 80,000 cfs, or (2) monitoring showing delta smelt near pumps, ending when spawning occurs (shown by spent females in trawl survey, salvaged spent females, or water temps above 12 degrees Celsius at 3 stations)	• 14 day running average instead of 7 day • Triggered after 3 days of increased salvage (or monitoring), rather than after Action #1 or by fixed date •
Action 3	OMR between -750 and -5,000 cfs, following onset of spawning or Delta water temps reach 12 degrees Celsius, ending when entrainment risk abates or June 30	OMR flows calculated based on PTM modeling that reduces PEI to 5% for 14 day running average, triggered by end of Action 2, ending on June 20. Estimated OMR flows range from -2,000 to -8,000 cfs	• Significantly higher OMR reverse flows • Uses 14 day running average period to calculate flows.
Action 4	Implement VAMP	NOT INCLUDED. VAMP has now expired.	VAMP has expired. NMFS looking for suggestions for what to do re: salmon and VAMP.
Action 5	HORB or 3 south delta agricultural barriers cannot be installed	NOT INCLUDED. ("Under the Action 3 discussed below the OMR flow targets would be adjusted to provide the same level of protection to delta smelt with or without the [HORB]."	OCAP BA includes operation of HORB and South Delta Temporary Barriers Project during the Spring and Fall.
Actions 6-	Delta smelt monitoring / sampling	Not included in this proposal.	

8	increased		

I. Introduction:

- Focuses on "other stressors":
  - Makes argument that water project operations are only one factor, and need for more holistic measures to protect and restore species,
  - Identifies BDCP as the process that can take these holistic measures.
- Adaptive approach:
  - Need for an adaptive approach to fish protection, because the environment is variable and operational changes and benefits to fish species are "the subject of much scientific debate."
  - Adaptive approach here means "specific actions with a range of operational criteria that can vary, based on real time monitoring of key parameters, and within a prescribed decision making process."
- Compares proposal to the EWA:
  - "A key in that decision making process is the establishment of a budget to ensure the balance of the uncertainty of benefits to fish populations of water project related actions with the known water project costs." CALFED EWA is such a program, and it notes that "the Fish Protection Trigger approach described below is much simpler to implement than the CALFED EWA."
- Benefits to Salmon:
  - Argues that, "While these actions are targeted to protect delta smelt they occur at times that will also provide benefits to salmonid species."
  - Includes example of Head of Old River barrier, stating that Wanger rules prohibited use of barrier to protect delta smelt, but that actions proposed herein (OMR flows) would achieve the same level of protection to delta smelt with or without the HORB.

II. Description of Fish Protection Trigger:

- Described as CVPIA b(2) water, with limited assets:
  - "The Fish Protection Trigger is proposed as a SWP analog to the Federal b(2) account set forth in the federal [CVPIA]."
  - Focuses exclusively on reduced entrainment ("avoiding possible peak entrainment events"), and does not discuss or address any other impacts of the projects (e.g., reduced fall open water habitat, x2, etc.)
  - Admits that there may be "unexpected circumstances where the b(2) and FPT assets may not be sufficient to address all the water project operational impacts" and to avoid jeopardy.
  - Does not describe what the assets are.
  - States that if the assets are exceeded, there would be a decision-making process to address it. Describes the process, but without specific measures to take; defers to the WOMT in most cases, unless consensus on the WOMT cannot be reached, in which case the 5 agency directors would meet.
  - DWR and USBR "would be responsible for accounting for the impact of the fishery actions on SWP and CVP supplies on an ongoing basis as has been the case under the CALFED EWA since 2001."
  - If agreed to by the 5 agencies, DWR and USBR would fund independent peer review every two years, with guidance of the CALFED science program.

III. Potential Effects of the FPT on delta smelt:

- Factors affecting entrainment
    - Acknowledges that adult delta smelt are vulnerable to entrainment when they enter the central and south delta, and that juvenile delta smelt that are born in the central / south delta are vulnerable to entrainment until they move downstream to the western Delta.
    - Identifies mid-Dec to March as adult risk period, and states that juveniles in the south and central delta are vulnerable until June or early July.
    - States that, "Delta inflow, outflow, and turbidity appear to stimulate or at least are closely associated with the upstream migration of delta smelt, and thereby their susceptibility to entrainment." Identifies the first pulse of freshwater runoff from delta tributaries as the period of peak adult entrainment, citing Grimaldo *et al* (in review).
    - Admits that south Delta flow is also associated with delta smelt entrainment.
        - Cites Kimmerer and Nobriga (2008) for proposition that, "Particle tracking modeling also suggests that OMR is associated with the entrainment of larval and early juvenile delta smelt March through May."
- Effects of Entrainment unclear:
    - States that the effect of entrainment on delta smelt population is less clear, and cites Manly and Chotkowski (2006) for proposition that "OMR flow (and presumably the entrainment of delta smelt associated with it) could account for only a few percent of the long-term variation in the delta smelt adult abundance index."
    - Argues that there is a "weak relationship between the long-term trend in OMR flow or salvage and the variation in the delta smelt abundance." Gives 3 reasons why this may be the case:
        - 1) Bill Bennet's "Big Female" hypothesis (disproportional entrainment of the larger, earlier spawning females has led to smaller fish that produce fewer eggs)
        - 2) Episodic periods of very high entrainment could have a substantial effect on population abundance that the effect would appear small when averaged out in an analysis that includes many more years when entrainment does not substantially affect abundance.
        - 3) Losses of smelt "due to water project related effects are always small compared to other controlling factors like temperature or food."
    - States that Kimmerer (2008) found that despite substantial entrainment losses (1997-2005: adults 1-50%, with a median of 15%; juveniles 0-25%, with a median of 13%), but that "Kimmerer (2008) also pointed out that the effect of these losses on the population abundance was unclear and obscured by subsequent 50-fold variability in the survival of delta smelt from summer to fall, possibly due to substantial variations in summer zooplankton abundance."
- Argues that food and temperature effects on abundance are greater than entrainment
    - claims that "summer food, temperature, or both may at times and perhaps usually have a substantial effect on delta smelt abundance and overwhelm any effects that entrainment effect might have on delta smelt abundance."

- Cites Bennett (2008) for proposition that high water temperatures in summer of 2005 significantly contributed to low abundance in the fall
- "Fullerton and Sites' (personal communication) found that summer temperature changes and food supply can account for over 75% of the variation in the relative abundance of delta smelt from fall to summer over the period of record since 1971." They also claim that these same factors can account for about 75% of the variation in the relative abundance of delta smelt from summer to fall since 1988.
- "Their [Fullerton and Sites?] more recent work, to be presented at the CALFED Science Conference in late October 2008, suggests that ammonia in local discharges can dramatically affect smelt abundance.
- Cites an analysis by Bryan Manly (which is included in the materials sent to USFWS) that had similar results re: temperature and food, which found that "declines in rotifer zooplankton abundance were most closely related to the declines in delta smelt abundance fall to summer."
- Notes that while "Manly's analysis differs in some respects from Fullerton and Sitts', their results both suggest that the change in temperature and valuable food sources are significant contributors to the decline in delta smelt abundance. Neither Fullerton and Sitts nor Manly found a negative population effect of exports, export-related mechanisms salvage or fall salinities on the abundance of delta smelt. In fact, Manly found a positive correlation between delta smelt abundance and salvage of delta smelt, indicating that salvage of delta smelt may be more an indicator of relative abundance than a factor adversely affecting the abundance of delta smelt. These findings suggest that summer temperatures which approach the upper range suitable for delta smelt survival and decreases in valuable food sources maybe major contributors to the 50-fold variability of the summer to fall survival found by Kimmerer (2008)."

IV. Potential Actions to Protect Delta Smelt (the Fish Protection Triggers)

- Use of FPT
  - Proposes that "USFWS should consider allocating the state FPA [sic] and federal b(2) assets discussed above to implement the three actions described below to reduce entrainment of adult, larval and juvenile delta smelt."
- Comparison to Wanger Rules
  - Argues that the first two actions are "refinements" in Wanger rules, and third action can "better tailor operations" to reduce episodic entrainment events.
- X2
  - No proposal for changes to fall X2 location, claiming that there are several factors unrelated to salinity that correlate with changes to summer to fall abundance of delta smelt, and until more is known about these factors and "the likely actual cause for changes in the summer to fall abundance, it is not prudent to establish a fall X2 action. Also, fall X2 actions for the protection of delta smelt could severely impact project water supply and the projects' ability to maintain sufficient cold water in their upstream reservoirs to protect listed salmonids."

<u>Action 1: Pulse Flow Action</u>

Trigger = (1) On or after Dec 20,

(2) when 3 day average Freeport flow is between 25,000 and 80,000 cfs, and
(3) average turbidity exceeds 12 NTU for 2 consecutive days at False River, Prisoners point, and Holland Cut (all three)
[NOTE that they use False River station rather than Victoria Canal station – change from 2008]

Action= Achieve an average net upstream OMR flow between 2,000 and 5,000 cfs over a 10 day period, commencing within two calendar days of the trigger

End = (1) ten days OR
(2) 3-day Sacramento River flow at Freeport increases to greater than 80,000 cfs OR
(3) onset of spawning, whichever comes first

Rationale: * "Recent DWR analyses indicate that together Sacramento River flow and turbidity within the Delta are better predictors of when this upstream migration is going to occur than when only flow or turbidity is used alone"
* The criteria would have triggered export reductions within days of delta smelt salvage in 10 of 12 years, excluding 1996 (because of suspect turbidity data)
* The trigger did not work well in 1997 and 1999, which had very high flow events
* "In 1996 and 2001 a trigger which includes both Freeport flow and Delta turbidity was significantly better than one which only relied on that flow or turbidity; in other years using the flow and turbidity in the trigger was good or slightly better than using the flow or turbidity."

Diff from Wanger: The primary difference is that we suggest USFW provide itself the flexibility to consider actions ranging from between -2000 and -5000 OMR, instead of only -2000 cfs.

<u>Action 2: Adult Smelt Action</u>

Trigger= (1) combined SWP/CVP salvage increases steadily for 3 consecutive days and 3 day average Sacramento River flows (at Freeport) is less than 80,000 cfs; OR
(2) delta smelt surveys show significant number of delta smelt in the South or Central delta

Action: Net upstream OMR flow maintained at 5,000 cfs.
The flow is a 14 day running average, with a 7 day running average within 1,000 cfs of the applicable 14 day running average

End Action= When delta smelt begin to spawn (as indicated by spent females in Spring Kodiak Trawl, in salvage at SWP/CVP, or when daily average water temperatures at Mossdale, Antioch and Rio Vista exceed 12 degrees Celsius)

Rationale= "Rather than following immediately after the pulse flow action on or after January 15th, it begins on seeing increasing salvage at the SWP and CVP fish salvage facilities. This refinement is designed to avoid implementation of this costly action in years such as 1997 and 1999 (see Figure 1) **and as happened in 2008 when it probably has little or no benefit to delta smelt."**
"In 8 of 12 years the proposed action, like the 2008 action, would have been triggered during or soon after the first pluse flow action."
Action 2 is basically triggered by showing that Action 1 failed to move smelt out of the south and central delta.

Diff from Wanger: The averaging period for meeting the OMR criterion is different (using a 14 day running average, rather than a 7 day average). "The 14 day averaging period provides SWP and CVP operators with the flexibility they need to deal with tides and barometric conditions outside their direct control."

Action 3: Larval and Juvenile Delta Smelt Action

Trigger= End of Action 2 (spent females in Trawl, salvaged, or water temps)

Action= "Net upstream OMR flow not to exceed the targets as determined using the latest fish distribution and abundance survey data and the Particle Tracking Model. To eliminate potential peak entrainment events that have occurred in the past, the Potential Entrainment Index (PEI) target determined by the PTM is not to exceed 5% in any 20-day period."
"The flow will be a 14-day running average. Simultaneously, the 7-day running average shall be within 1000 cfs of the applicable 14-day running average."
"The range of the upstream OMR flows expected from this action is between 2,000 to 8,000 cfs based on the action distribution of delta smelt except under unexpected conditions discussed above."

End Action= June 20th

Rationale = Use PTM to develop the OMR operational criteria, based on delta smelt distribution from DFG 20 mm delta smelt survey. This clearly ties operational criteria to the proportion of the fish population at risk of entrainment.
"Based on our analyses, DWR proposes that the regressions be used to estimate preliminary OMR criterion that would keep the Potential Entrainment Index of juvenile delta smelt over the following 20 days at or below 5%. Figure 11 of Attachment 2 shows that this PEI goal will usually keep the annual PEI below 10% and well below historical levels."
"If the fish population falls below levels that can be detected at both the Kodiak and the 20mm surveys, the target OMR could be calculated using the PTM to keep the entrainment of injected particles in the central Delta (such as the 20 mm station 815) below some specific percentage."

> "The proposed method is similar to that used by Kimmerer (2008) in that it estimates the percentage of the smelt larvae and juveniles entrained by the CVP and SWP. However, rather than using fish survey results and OMR flow to estimate the proportion of the larval and juvenile population entrained in the past, as Kimmerer did, the proposed method would use the PTM model to calculated [sic] the OMR needed to keep the future entrainment of the larvae and juveniles below some predetermined portion of the smelt population."

Diff from Wanger = Use 14- and 7-day running averages, rather than only the 7-day average used in 2008. Also, the flows allowed appear to be significantly greater than the existing rules.